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SCIENTIFIC AGRICULTURE.

AN

ADDRESS

DELIVERED BEFORE THE

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ADDRESS.

It is an interesting evidence of Divine Beneficence, that there is intermingled with the immensely varied pursuits of men, so nearly an equal portion of enjoyment. So wisely adapted to our circumstances are the laws of habit, that we soon become contented, and even pleased, with a situation, which seemed at first, the grave of all our comforts. But this is not all. There are sources of enjoyment in every occupation that are peculiar; that exist in no other. Hence it happens, as a general fact, that men have no wish to change employments with their neighbors. We may covet some particular possessions, or circumstances of our neighbor; but when the question is, whether we will entirely change situations with him, the preference we feel for our own profession or art, will, in most cases, give a ready negative to the enquiry. What but necessity will bring the sea tossed and hard-faring sailor to settle down contentedly in the peaceful farm house, with all its security, and all its plenty. On the other hand, what but irregular habits, or disappointed hopes, will tempt a man, who has become habituated to the pleasure of cultivating his own farm, to commit himself to the mercy of the waves and storms of the ocean. You may, indeed, draw the artizan abroad for a day or two in the summer, to relieve the pressure of the farmer. But he goes back again to his shop, gratified that an easier task is his, than to toil beneath a burning sun. I know that the hard laboring man not unfrequently looks with an envious eye and discontented feelings upon his rich neighbor, rolling past him in his coach; and upon the professional man, who is seen fanning himself in the shade, during the sultry heat of July, while he is compelled to go forth, unprotected, under

the rays of a meridian sun. But let him only become acquainted with the corroding cares, the oppressive listlessness, the ennui, and the crowd of diseases that follow the chariot and watch around the dwellings of the affluent:—let him be told how much of anxiety and labour and sleeplessness the intellectual efforts and collisions of the professional man require; let him see in the wasted form and languid countenance of the scholar, what a sacrifice of health the acquisition of knowledge often demands—

> ——————————how hard it is to climb
> The steep where Fame's proud temple shines afar;
> ——————————how many a soul sublime
> Has felt the influence of malignant star,
> And wag'd with fortune, an eternal war;

let the laboring man but partially realize these things, and he will be thankful that he is neither very rich, nor very learned.

It cannot be denied, however, that some of the employments of men afford more numerous and certain means of happiness than others. Nor will many dissent from the opinion, that in this respect the pre-eminence must be awarded to agricultural pursuits. If, as the poet says,

> " Reason's whole pleasure, all the joys of sense,
> " Lie in three words, health, peace, and competence;"

why has not the farmer the very essence of earthly happiness within his reach. So directly do his labours tend to promote health, that they are the resort of invalids from all other employments; and often form the physician's last and best prescription. Peace too, if ever she finds a resting place in this disordered world, will fix her station in the retired mansion of the farmer. Nor will competence follow far behind, when health and peace and industry lead the way.

In the acknowledged fact that agricultural pursuits are more favorable to human happiness than any other, I see, if I mistake not, additional indications of the goodness of God. For this must be the employment of the great mass of mankind: And to make it the easiest avenue to enjoyment, will, therefore, swell

the amount of human happiness more, than if the like pre-eminence had been granted to any other art or profession. True, we have not now a paradise to cultivate: and the thorn and the thistle starting up on every side of us, are mementos of that curse which followed man from the Garden of Eden. Still, in that curse we perceive a mixture of mercy. The heart of infinite benevolence seems to have yearned towards our guilty race, even at the moment when they were driven from Paradise, and the sword of a broken law turned every way to prevent their readmittance. In the bitter cup that was given man to drink, there was mingled an antidote to the poison. Though he must henceforth eat his bread in sorrow and in the sweat of his face, yet would that very labor prove the greatest alleviation of his trials that could be granted to a fallen being.

In this light have almost every age and nation regarded agriculture. National and individual happiness has ever been known to be most intimately linked with the successful cultivation of the soil. We cannot say much, indeed, concerning the views and efforts of the antediluvians on this subject. We have but one history of those times, and this so concise, that it casts but a glimmering light on that long period of darkness. All the vestiges of science and civilization, that might have existed, have been swept away by the deluge: and the flood of the world has proved almost the flood of oblivion.

Nor are the ages that for a long time followed, involved in less obscurity. The building of the Tower of Babel indicates a state of prosperity, and an acquaintance with architecture; and hence we derive presumptive evidence in favor of a correspondent advancement in agriculture.

When the descendants of Abraham were securely settled in Palestine, they devoted themselves almost exclusively to agricultural pursuits, from the chiefs of the tribes to the lowest menial.

The Chaldaens made improvements in husbandry, before unknown. They seem to have ascertained some method of recruiting an exhausted soil, and were thus prevented the necessity of frequently changing situations, like most other ancient Oriental nations.

The proverbially fertile soil of Egypt enabled its inhabitants every year to raise vast quantities of corn : and so highly was agriculture esteemed among them, that they ascribed its invention to their chief god, Osiris ; and even paid divine honors to the animals employed in cultivation, and to the products of the earth.

In India too, in ancient times, Bacchus was worshipped as the inventor of planting vineyards, and other agricultural arts.

The Persian kings also, once each month, laid aside the splendors of royalty, and ate with their husbandmen. Agriculture was incorporated into their religion; and it was one of their maxims, that he who sows the ground with diligence, acquires more religious merit, than by the repetition of ten thousand prayers.

The Phenicians or Philistines, and the Carthagenians, were not unacquainted with agriculture : and Mago, a celebrated Carthagenian general, is said to have written twenty-eight books on the subject, which were translated into Latin by command of the Roman Senate.

The ancient nations of Europe seem to have been much behind the Asiatics in their acquaintance with the cultivation of the soil ; for we find the early Grecians deriving their subsistence, like the wild beasts, from roots, herbs, and acorns.

The Athenians, however, ere long found that the bosom of the earth was not made merely to tread upon. Their princes recalled their subjects from predatory warfare to learn the peaceful arts of husbandry. The other States of Greece soon followed the example, and agriculture rose into a regular and important art. Their first writer on the subject was Hesiod, who embellished his work with the imagery and harmony of poetry. Zenophon, Democritus, Aristotle, Theophrastus and others, employed their pens upon the same subject.

The high regard in which agriculture was held among the Romans is well known. Even their most illustrious Senators and commanders, in the intervals of public duty, devoted themselves to its pursuits. Regulus requested to be recalled from his command in Africa, that he might attend to the cultivation of

his farm. And Cincinnatus received the summons to lead the armies of the republic when following the plough: and when that call of his country had been obeyed, and success had crowned his arms, he returned again to his interesting occupation.—Cato, the Censor, composed a treatise on the subject. Varro followed him in a more regular work: and finally, Virgil gave immortality to Roman agriculture, in his Georgics. An art thus patronized by the rich and powerful,and occupying the attention of the learned,must have been carried to a considerable degree of perfection: though the want of any thing like a correct theory of agriculture, and the substitution of numerous superstitious notions, must have greatly impeded its progress.

But the Roman power was now on the wane. Corruption had fixed upon the vitals of the State, and this vast fabric of empire, which was impregnable to all foreign assaults, must sink by the slow workings of internal disease. Long did Rome linger over her fall: But at length the huge pile of Gothic barbarity and ignorance, was raised on her ruins. For more than ten centuries, a thick darkness brooded over the world. Religious intolerance and superstitious ignorance, those spirits of night, wielded their two edged swords over the human mind, and lopped the first buddings of genius and truth. Though here and there a feeble light was seen, breaking through the darkness, yet it was not till the middle of the fifteenth century, that science and art were seen rapidly rising from the chaos. In 1478, Crescenzio a Florentine, published a valuable treatise upon agriculture: and he was followed by many of his countrymen in the same track.

Concerning the state of agriculture in Great Britain, previous to the fifteenth century, we know but little. We may conclude, however, that when men begin to write books on any subject, an interest in it is excited in the community; and as early as 1534, Anthony Fitzherbert produced a philosophical and ingenious treatise upon agriculture. But in the succeeding hundred years, nothing appeared on the subject, worthy of notice. Indeed, though rural economy, sometimes waxing and sometimes waning, was upon the whole slowly progressing, yet no remark-

able epoch in its history occurred till near the close of the seventeenth century. In the early ages of Modern Europe, the Feudal system exerted a most unpropitious influence upon agriculture. So military was the spirit of that system, such a servile dependence did it produce on the one hand, and such a haughty aristocracy on the other, that both science and art were withered by its touch: and though the system itself has long since been nominally extinct, yet its influence remained for centuries.

But a still more powerful obstruction to the progress of agriculture, was an almost entire ignorance of the scientific principles on which it is founded. Till near the close of the last century, the very sciences from which those principles are derived, can hardly be said to have had an existence. Previous to that period, therefore, treatises upon agriculture were merely a collection of common place maxims, partly true and partly false, mixed with most extravagant hypotheses and wild and hurtful superstitions. And it is only justice to say, that the Agricultural Chemistry of Sir Humphrey Davy, contains more new and valuable principles to guide the agriculturist in making improvements in husbandry, than all which the experience and science of preceding centuries had developed. And it is to be imputed mainly to the application of these principles, by intelligent men, that agriculture, within the last half century, in Europe, and particularly in Great Britain, has made such rapid progress.

I know, indeed, that there is a prejudice existing in some minds, against the application of scientific principles as guides in agricultural experiments. It is thought that they serve rather to bewilder, than direct. But if the agriculturist be not guided by scientific principles, what shall he follow? True, his own experience alone may do much to assist him; and it has accomplished wonders in times past. But will not a correct knowledge of the composition of soils, of the food of plants, and of the mode in which that food is converted into nourishment, will not this knowledge prove an important auxiliary to experience? The experience of one man teaches him it is important he should observe the position of the moon, or whether the day of the week be lucky, or unlucky, when he sows and when he reaps. But

science tells him, that these, and a hundred other similar observances, are not only useless, but often defeat his experiments. In every other art we regard the most scientific artisan, as most likely, other things being equal, to make improvements. Why should it be different—it is not different—in agriculture? In short, physical science is nothing but the result of the most accurate and enlightened experience.

If I mistake not, it is one important object of agricultural societies to give a right direction to the efforts of the experimenter, by furnishing him with correct scientific principles. Permit me, therefore, gentlemen, to spend a few moments in the exhibition of those principles that lie at the foundation of agriculture; and in their application to practical husbandry. In doing this, I shall avoid as much as possible the use of technical phraseology.

There are three sciences, Chemistry, Botany, and Geology, with which the theory of agriculture is most intimately connected. Chemistry teaches us what is the composition of plants, of the soil in which they grow, and of the atmosphere that surrounds them; and of consequence, shows us what is their proper food, and the best manner of applying it. Botany dissects the vegetable kingdom, and discloses those curious vessels by which the food of plants is taken up and converted into the numerous distinct principles and parts which they contain. Geology instructs us in the general nature of the soils in which vegetables flourish, and enables us to predict what varieties of soil will be most favourable to particular plants.

The first point that should engage the attention of the enlightened agriculturist, is to ascertain the nature and situation of those minute vessels by which plants absorb water from the soil and the atmosphere, and by which these principles are modified and circulated to every part of the vegetable, and are converted into the plant itself. So minute are these vessels, that even microscopic observation has not been able to detect all their intricacies. But their general structure and arrangement have been ascertained. And it is found that they bear a most striking analogy to those vessels of animals by which nutriment is conveyed, in ceaseless circulation, to every part of the system. In every plant we

find one set of small vessels, running from the roots to the extremities, through which the sap ascends, while in its progress it is undergoing those changes that will fit it for becoming a part of the vegetable. These vessels resemble the arteries in the animal system. When the sap is thus conveyed to the leaves and other extremities of the plant, it there comes in contact with the atmosphere, gives off its redundancies, and absorbs water, and perhaps other principles, essential to the health of the plant.* The leaves of plants, therefore, perform nearly the same functions as the lungs of animals. A second set of vessels, exterior to the first and mostly confined to the bark, now conveys the food of the plant, thus prepared, to every part that needs nourishment; even to the very roots from which it proceeded. These vessels correspond to the veins. Other vessels are found in plants, corresponding, probably, to those similarly situated in the animal system; yet too complicated for explanation on this occasion. Suffice it to mention, that in the vegetable, as well as animal economy, we find the principle of life—itself inscrutable—modifying and controlling every operation and keeping the wonderful machinery in ceaseless play.

So much for the botany, or rather anatomy, of the vegetable kingdom. We next enquire what are the simple substances that enter into the composition of plants; for until the agriculturist knows this, how shall he ascertain what materials are best adapted to their nourishment? And Chemistry stands ready to answer the enquiry. Out of the fifty simple substances or

* It has been the general opinion of botanists and chemists, that the leaves of plants absorb, from the atmosphere, *Carbonic acid;* or that gas called *choak damp*, found in wells and caverns, so fatal to animal life; and in this way they have supposed the atmosphere is purified. But the recent experiments of Mr. Ellis, a distinguished vegetable physiologist, have thrown so much doubt on this beautiful theory, that I did not feel justified in stating positively that the leaves of vegetables possess the power of absorbing this gas. Mr. Ellis supposes that the only use of the oxygen of the atmosphere is to convert the superabundant carbon, given off by the leaves of plants, into carbonic acid; exactly in the same manner as this is done by the respiration of animals. So far as agriculture is concerned, however, it seems of little importance in what way these points are determined: since it is agreed on all hands, that the pure air of the atmosphere should come in contact with the leaves of plants. See *Edinburgh Encyclopedia Article* Botany. p. 57, 58.

elements, known to exist, we find vegetables almost entirely composed of three, viz. charcoal and two gases. A few others are occasionally present, and in some cases seem essential to the constitution of the plant; such as silex, lime, iron, manganese, &c. It is by variously combining these few elements that the numerous proximate principles of vegetables, such as sugar, gum, starch, and the like, are produced; and also the unnumbered forms and properties of the stalk, the bark, the wood, the leaves, the roots, the flowers, and the fruit. A beautiful example of the simplicity of nature!

The next point on which chemistry affords light to the agriculturist, is the composition of the soil and atmosphere in which plants are placed. That they derive their nourishment from the first, if not the second of these sources, is certain. It is necessary, therefore, that in these, should be found all those simple substances that are essential to the constitution of vegetables; and the whole subject of manures consists of little else than an account of the modes in which these principles are supplied. The analysis of the soil will show which, if any, is deficient; and thus point to the best mode of supplying those that are wanting.

In regard to those changes that the sap of plants undergoes before it is converted into the vegetable itself, and its various peculiar principles, upon these changes, although entirely chemical, chemistry sheds but a feeble light. We know that every plant must be a perfect laboratory; for we see the sap, which is nothing more than water, holding a few things in solution, entering the vessels of the vegetable, and having passed through them, we find a most wonderful conversion of this sap into pith, wood, bark, leaves, flowers, fruit, and numerous peculiar and compound products; such as gum, sugar, acid, and the like. Here is proof that the most complicated and delicate chemical processes are continually going on in all living plants; processes that infinitely exceed the skill of the most accomplished chemist; and yet, they are hid, from even microscopic observation, by the minuteness of the vessels and agents concerned. We know only that a certain degree of heat and moisture are requisite, and sometimes light also, to carry forward the operation.

In these wonderful transformations, however, there is surely one thing the chemist can learn; and that is, a lesson of humility. While he is able, by putting in requisition all the resources of his art, to produce scarcely one of the simplest vegetable principles, twenty or thirty of these are annually formed in every plant.

By the science of geology we are made acquainted with the nature of the rocks that constitute the great mass of our globe. Now it is a well established fact, that soils are nothing more than rocks worn down or decomposed, and mixed with animal and vegetable matter. Hence, in most cases, the nature of a soil is determined by the nature of the rock beneath it. For instance, the soil along the Connecticut is in many places, of a reddish hue; because that is the colour of the rock beneath it. Not unfrequently, however, the materials that are worn away from one rock, are transported a considerable distance, and mingled with those from other rocks; and thus a soil is formed extremely compound in its characters.

From this view of the subject it appears that we may expect to find as many different soils as there are different rocks; and even more. All rocks, however, may be arranged into a few classes; and the soils resulting from the rocks of a class, will bear a general resemblance. The oldest and most enduring rocks, such as granite, constitute what is called the primary class; and the soils proceeding from their decomposition, may receive a similar designation. Nearly the whole of New England, except the valley of the Connecticut, is made up of primary rocks; and this same class of rocks extends in a southwesterly direction, gradually decreasing in width, through N. York, Pennsylvania, Virginia, North and South Carolina, and Georgia. All the towns in the old county of Hampshire, not situated in the valley of the Connecticut, are based on rocks of this class; accordingly we find in them all, a general resemblance of soil. The second class of rocks is called secondary; being newer, and generally less hard and enduring. The valley in which we are situated, extending from New-Haven to the south line of Vermont, is of this description. Two of the most important members of this class are here abundant; viz. the old red sandstone—whose very name describes it,—and

the peculiar rock, generally called *trap rock*, that constitutes the precipitous ridges of Holyoke and Tom. Secondary rocks are of immense extent west of the Hudson and North West of the Alleghanies, extending even to the Rocky Mountains.

The third class of rocks, or rather of soils, is called the tertiary; because they lie above the secondary, and were therefore subsequently formed. This class consists of regular layers, or beds, of sand, clay and gravel. The extensive sandy plains, on both sides of the Connecticut, principally south of this village, are a good example of this class. Wherever the sand is worn away to a considerable depth, the clay lying underneath, is made visible. All that extensive level country south of New York, along the sea-coast, widening as you advance, and embracing a large part of the southern States, consists chiefly of the tertiary class of soils.

The fourth and last class of rocks, or soils, is the alluvial. This consists of all varieties of soil, mingled and spread over low grounds by the agency of water. This is the richest and most productive of all soils; and our own Connecticut and its tributaries, particularly the Deerfield, the Westfield and the Farmington, exhibit many interesting tracts of this description along their margins. They are scattered too, all over our country; and the world does not furnish a nobler example than is seen along the Mississippi.

From this sketch, Gentlemen, it appears that the region of country embraced by this society, contains almost every variety of rock, and therefore a correspondent variety of soil. And since different vegetables require for their perfect developement, different soils;* this circumstance must be regarded as highly propitious to the prosecution of experiments. Do you enquire for

* For instance: whoever compares the plants, shrubs and trees, growing on Holyoke, or Tom, which consist of *trap rocks*, with those found on the primary mountains of equal height in the vicinity, will find many on the former, that do not grow at all, or very rarely, upon the latter. Indeed, he will find as much difference in the vegetables, as he would, in travelling southward through several degrees of latitude. A diversity nearly as great will be found on comparing the plants of Mount Toby, in Sunderland, or of Sugar Loaf and of the range extending northward from this through Deerfield and Greenfield, known by the names of "the Ledges" and "Rocky Mountain," with the plants of the primary mountains on the east or west a few miles distant.

a soil resulting from the decomposition of granite? You have it in Williamsburg, in Whately, in Belchertown, in Amherst and Leverett.—Do you need soils derived from the other primary rocks? You have them in nearly all the more elevated parts of the three counties. Do you wish for a soil whose base consists of disintegrated red sand stone? You have it in Gill, in Greenfield, in Deerfield, and in many other places. Does your experiment require what European writers denominate a basaltic soil? The eastern slope of the ridge, constituting Holyoke and Tom, furnishes an example nearly identical with this. Do you wish to compare the produce of land in the vicinity of the coal mines of Europe, with that of our own coal formation? Then you have only to perform your experiment in Granby, or South Hadley, in the eastern part of Longmeadow, or the western part of West Springfield. And as to soils of the tertiary and alluvial classes, you have a wide extent of the former in the plain extending from South Hadley through Springfield to Enfield; and in the plain between Northampton and Southwick: and what finer examples of the alluvial could you wish, than the rich meadows of Northfield, Deerfield, Hatfield, Northampton, Springfield and Longmeadow?

But more than all this. Not only does the whole extent of these counties present so many varieties of soil, but in some instances a single township contains them nearly all. Northampton, for instance, has its fine alluvion on the east, and on the north and south, its tertiary. On the west we find granite and a granitic soil. Along the western foot of Mount Tom, is the old red sandstone with its peculiar soil: the mountain itself presents the basaltic variety; and along its eastern base, is the soil peculiar to the coal formation. A variety almost equally great, exists in Hatfield, Deerfield, Northfield, Montague, Westfield, Amherst and Belchertown.

I am aware, indeed, that there is one variety of soil, and that not an unimportant one, which can hardly be said to have an existence along the Connecticut. I refer to what is called a calceous soil; or one proceeding from lime stone. Yet as a sort of substitute for this deficiency, I trust I shall be pardoned for allud-

ing to the recent discovery of a variety of limestone along this river, capable of forming the water proof cement. It is interesting that this should be brought to light, just at the time when it seemed indispensable to the successful prosecution of a grand work of internal improvement, which, to say the least, will be to the western branch of the valley of the Connecticut, what that noble river is to the eastern. The discovery is interesting too, because, if I mistake not, the variety of limestone here employed, which is the bituminous, has never before been used for this purpose. And finally, I might remark, that such are the associations of this limestone, that we may expect to find it almost any where along this valley, between New Haven and Vermont.*

But to return from this digression. I have now given a general view of those principles of Botany, Chemistry and Geology,

* The limestone chiefly employed in Europe and New York for water proof cement is the blue argillaceous; and I cannot learn that the bituminous has ever before been employed It is found along the Connecticut as one of the members of the coal Formation, which extends from East Haven, in Connecticut, to Northfield, Massachsetts; and hence we may hope to find this limestone in any intervening place where this formation exists. It has already been found in Middletown, Southington, West Springfield, and at Mount Tom.

I take the liberty here to mention that gypsum and rock salt almost always occur in connection with a soft red rock, usually slaty, called Red Marle: and on comparing specimens of the red marle which accompanies the gypsum in New York and Nova Scotia, with one of the members of the coal formation along the Connecticut, I cannot discern the least difference. I am not therefore altogether without hope, that beds of gypsum may one day be discovered along this river. All light coloured and soft rocks that are found in those towns where the coal formation exists, (ex. gr. Longmeadow, Springfield, W. Springfield, S. Hadley, Granby, Sunderland, Montague and Gill,) should be examined with care. If they do not effervesce by pouring on them oil of vitriol or aquafortis, they will probably prove to be gypsum, If they do effervesce, they are limestone.

I have long thought it an object of great importance, in an economical point of view, to most of the inhabitants of these counties, to discover within their limits a bed of common limestone, which by burning would furnish mortar for the ordinary purposes of building: and I have known for many years, that a coarse variety of limestone exists in Williamsburg, Whately, Conway, Goshen, Chesterfield, Deerfield, Shelburne, Ashfield, Buckland, Colrain, Leyden, &c. but I have never till the present time (Dec. 20th.) found leisure and opportunity to make any experiments with this stone as a mortar. Having recently subjected some pieces of it to the heat of a chemical furnace, it was converted into quick lime; and on being slacked, and a quantity of sand, somewhat less than is usual, being mixed with it, it formed a mortar, which, though very dark coloured, hardens, for aught I can see, as soon and to as great a degree, as lime mortar in general. If any gentleman is disposed to pursue this experiment on a larger scale, I shall be happy to show him specimens of the limestone and the mortar, if he will call at the Laboratory of Amherst College.

that form the groundwork of the theory of agriculture. There are other sciences, however, that have a less intimate, though not unimportant connexion with the subject.

Almost every person, for example, has noticed how very great is the influence exerted over the growth and colour of plants by light. Here then we perceive a relation to the science of optics.

Gravitation also, is not without effect in giving direction to the roots and branches; though some other controlling power—perhaps an instinct—must be called in to explain all the phenomena.

It is well known how the produce of the soil varies with the state of the atmosphere, in respect to its weight, its moisture, its temperature, and purity. Hence we see how important a relation exists between agriculture and meteorology; though it must be confessed that this branch of knowledge is yet extremely deficient even in fundamental principles.

The effect of electricity upon vegetation is much more powerful than is generally supposed. Indeed vegetable life itself, may be only a modification of this power; and it is an ingenious suggestion of one of the ablest living philosophers, that those numerous chemical changes which are constantly going on in plants, may be the effect of galvanic or electrical action.* But apart from Hypothesis, we have facts proving directly, that electricity acts as a powerful stimulant to vegetation. For grain in low lands, exposed to powerful storms of lightning, is thereby blighted: and in similar circumstances buck wheat fails to be productive.†

But to dwell no longer upon the theory of agriculture; permit me, gentlemen, by way of application of that theory to practical husbandry, to make a few suggestions in regard to the mode of conducting agricultural experiments.

The frequent failure, and apparently opposite results of such experiments, are facts not to be denied. Indeed, so frequent

* Elements of the Philosophy of Plants by Decandolle and Sprengel, Sec. 373.

† Same work, Sec. 372.

have been instances of this kind, that many persons have lost all confidence in experiments, and regard this part of the business of agricultural societies as useless. But if there are any fixed principles on which agricultural processes depend, (and how can this be doubted, when we see the constancy of nature's operations in every thing else,) why ought we not to impute frequent failures in experiments, to the imperfect mode of conducting them; or to presume that the details are not given with sufficient minuteness, to enable us to judge whether they are, or are not, contradictory to others? Those conversant with philosophical and chemical experiments, know very well, that the most trivial and unthought-of circumstance often entirely defeats them, or conducts to an unexpected result. Much more then, ought we to expect similar occurrences in agriculture, where the processes are a thousand times more complicated and delicate, and scarcely understood at all. Hence then, it is an important enquiry, what is the best mode of conducting experiments in husbandry.

The first suggestion I would make, is, that such experiments be prosecuted according to the established principles of philosophy. I know that many an agriculturist will feel that I am directing him to lean on a broken staff. But by philosophy I do not mean mere airy speculation; but established principles, drawn by induction from the most accurate and long continued experience.—I mean the laws that observation has discovered, by which the operations in the natural world are conducted. And shall the experimenter prefer his own limited and partial experience to the accurate and enlightened observations of the whole world? Or shall he pay a regard to the thousand groundless maxims and whims that are floating among the ignorant, and are alike repugnant to philosophy and common sense? It is to the observance of such unsupported fancies—the relics of superstitious and marvellous times—that we are to impute the failure of many experiments. For even in this enlightened land, many such notions sway the belief and control the practice of multitudes. What a mighty influence, for example, is imputed to the moon, in almost every operation of the farmer! He cannot sow

or reap; he cannot cut down his wood or his timber, or even kill an animal for food, until the moon has reached some particular point of her orbit. And even in the soap making process of the housewife, the moon has a most important part to perform, even if she be in the nadir. Surely, if this harmless planet has so much labor to perform in husbandry, she ought to be released from her cares as ruling among the stars of the evening; and instead of being called queen of the night, her title should be, queen of agriculture!

But to be serious: such notions are the lingering remnants of astrology; ill agreeing with the spirit of this age, and altogether opposed to sound philosophy and good sense. Every enlightened farmer, therefore, will disregard them, and a hundred others of a kindred character; permitting them all to join that chaotic company of phantoms, described by Milton:

> "All these, upwhirl'd aloft
> Flew o'er the backside of the world, far off
> Into a limbo, large and wide; since call'd
> The Paradise of fools—to few unknown
> Long after————"

The second suggestion I have to make, in regard to agricultural experiments, is, that every circumstance which can mediately or immediately affect the result, should be carefully observed and recorded. The remark of a French philosopher, that "real and general advances will then only be made in the science of nature, when the dread of prolixity shall be overcome," may be pertinently applied to agriculture. The most trivial circumstance often reverses the result of an experiment: nor can we tell beforehand, so little do we know how to calculate the complicated operations of the vegetable world, what that circumstance may be; and often it finally eludes our search. Therefore, we must record every thing that can have any bearing upon the result; and thus shall we, in most instances, avoid the difficulty. But if the experimenter, after reasoning upon the subject, concludes this or that circumstance to be too trivial to be noticed, he will not unlikely, mislead himself and others in his conclusions. For in subjects of this kind, the philosophy of

experience, and the philosophy of reason, are often at variance.

One very important circumstance in all experiments upon the produce of land, is the nature of the soil. Perfect definiteness, however, in the description of soils, is not attainable; because they pass into one another insensibly. The rules adopted by Sir H. Davy on this subject, will, nevertheless, furnish us with convenient landmarks. "The term sandy soil," says he, "should never be applied to any soil that does not contain at least 7-8 of sand. Sandy soils that effervesce with acids, should be distinguished by the name of calcareous sandy soils, to distinguish them from those that are siliceous. The term clayey soil, should not be applied to any land which contains less than 1-6 of impalpable earthy matter, not considerably effervescing with acids. The word loam should be limited to soils containing at least one-third of impalpable earthy matters, copiously effervescing with acids. A soil to be considered as peaty, ought to contain at least one-half of vegetable matter."

Suppose the experiment relate to the application of manures. To judge of their effect, we should know the nature of the soil; the season of the year in which they were applied; the state of the weather at the time; whether wet, or dry; cold, or warm; clear, or cloudy; whether decomposition is just begun, or has proceeded far; whether spread uniformly over the surface, or otherwise; whether ploughed in immediately, or not; and the state of the weather subsequently.

In the paring and burning of lands—processes but seldom attempted among us—the character of the soil is a circumstance of prime importance; whether recently brought under cultivation—whether sandy, clayey, mossy, or peaty; whether naturally wet and cold, or warm and dry; whether drained previously to the operation: the state of the weather at the time, and subsequently, &c. Similar particulars should be noticed in fallowing.

Suppose the process to be transplanting. Most obviously a minute account of the soil whence the plant was taken, and of that into which it is introduced, is requisite. Also the state of the weather; the relative situation of the plant, in regard to the

meridian; its subsequent treatment, and the like. In engrafting and innoculating, besides the state of the weather, and the mode of performing the operation, we should state the age of the stock, and of the tree from which the scion or bud was taken.

In irrigation, not only the nature of the soil to be watered, and its previous state should be given, but also the character of the water brought over it; whether from a river, or a pond; a lake, or the ocean; and the character of the rocks and soils in their beds.

But not to dwell upon particular cases; I remark that there are certain circumstances of a collateral and more general character, that seem necessary to be made known, to enable us to judge correctly of an agricultural experiment. The most important of these relate to the state of the wind, the weather, and the temperature through the season. So important is the bearing of these circumstances upon the vegetable kingdom, that it is impossible we should rightly estimate the result of an experiment upon the productions of the soil, unless a meteorological journal, more or less perfect, accompany the result. One register of this kind might generally serve for a town; and how great would be the benefits of keeping one in each town, not merely to the interests of agriculture, but also to those of science! And since the state of the weather is a subject so deeply interesting to every class of the community, would it not be easily practicable, to obtain in every town, the means of observation, and an individual to whom the keeping of the journal would be a pleasure. In the innumerable discussions that take place, every where, concerning the weather, how very satisfactory it must be, to be able to appeal to some fixed standard, by which one day, one week, one month, or one season, might be compared with another. This would be substituting facts for vague conjecture; and would tend, more than almost any thing else, to convince men that neither the moon, nor comets, nor shooting stars, nor eclipses, are the principal causes of change in the weather.*

* I am not prepared to say that these things have no effect upon the weather; but we have no evidence that they exert any important influence in this respect; much less have we any data for calculating beforehand how they will affect the weather. An opinion, however, still exists, that makers of

In order that such a journal should answer the purposes of agricultural experiment, it should embrace a great variety of particulars. It should give a daily account of the temperature of the air, according to the thermometer; and of its weight, according to the barometer. It should notice the direction, force, and changes of the wind; the state of the sky, whether clear or cloudy; the quantity of rain, hail, sleet and snow in each month; the number and relative severity of storms of lightning, and the moisture of the atmosphere, as measured by appropriate instruments. That these circumstances have very great influence upon the growth of plants, the following paragraph from the writings of an able observer will show. "In the same tree he observed that in a cold cloudy morning, when no sap ascended, a sudden change was produced by a gleam of sunshine of half an hour; and a vigorous motion of the fluid. The alteration of the wind from south to north, immediately checked the effect. On the coming on of a cold afternoon, after a hot day, the sap that had been rising, began to fall. A warm shower and a sleet storm produced opposite effects."

Do these suggestions seem to any who hear me, to partake too much of the nature of mere philosophical speculation, and to be too refined, for the adoption of the practical farmer, even if he be an intelligent one? Far be it from me, gentlemen, to propose as your guides, mere philosophical conjecture, or abstract reasoning. So far as these suggestions are not based upon experience, let them be disregarded. But I would have this Society

Almanacs, by knowing the position of the heavenly bodies, are able to predict the state of the weather as easily as the time of an eclipse. And hence it is, that predictions of the weather are inserted and tolerated in almost every Almanac. But if the *confessions* of one, who formerly constructed an almanac for several years, may be believed, I assert that there is not, in the whole circle of science, a single principle that will enable a man to foretell, for a single week, the state of the weather. Some may recollect that the predictions of the weather in the "Country Almanac" were thought, by many, to be remarkably accurate: yet those predictions were mere conjecture—for one year they were copied from an old almanac that happened to be at hand. And I assert, without fear of contradiction, that no other almanac maker has any thing better than conjecture to guide him in this matter. Is it not then morally wrong, to continue to insert these predictions in an almanac, without stating expressly that they are conjectural? The Christian Almanac is, I believe, the only one in the country that has yet had the courage to make this declaration, and to free its diary from this imposition.

aim high. Agricultural experiments, imperfectly conducted, and partially detailed, are not wanted. Enough of them have been already made; and they have served only to fill up the records of husbandry with contradictory and perplexing results. And where can a Society be pointed out more favorably situated than this, for setting a better example; for bringing to this work minds versed in the principles, as well as hands skilled in the art, of husbandry? Think of the extent of territory and amount of population embraced by this society. Consider too, that here is almost every variety of soil and situation on which to operate. Neither forget how widely industry and intelligence are diffused in this centre of New England. With such materials, ought this society to content itself with feeble aud immethodical efforts? How easy for it to take a high stand among kindred institutions, and to make its light go out over the land, and descend upon unborn generations?

And permit me here to say, gentlemen, that the objects you have in view are worthy of all the zeal, and effort, and perseverance, you may embark in the enterprise. These labours are not calculated to build up the fortunes of a few, upon the degradation and poverty of the many. They are not undermining the foundations of our free institutions, and paving the way for anarchy or despotism. On the other hand, they tend directly to elevate the character, and increase the happiness, of the great mass of the citizens: If pursued successfully, they will spread over these hills and vallies, an air of comfort, and independence, and intelligence, far superior to that they now exhibit, with all their lovelines. By the blessing of Providence, this society has it in its power to double and to treble the present population of these counties without diminishing their enjoyment; so that the future traveller shall see our roughest mountains and glens smiling with cultivation and fertility. By giving a spur to industry, and fixing a stigma upon indolence, it will take away one of the grand sources of vice, ignorance and misery: so that an increase of numbers shall not be an increase of corruption. And while that increase will strengthen the arm of a virtuous ruler against foreign

enemies, it will band together a firmer phalanx to resist the encroachments of designing men upon our liberties and rights.

The objects of this Society are likewise worthy of vigorous pursuit, on account of the personal enjoyment their prosecution affords. Earthly happiness is not a phantom; it has a positive existence, confused and disordered as the world is. And we all of us taste more or less of this happiness, as we are hurried along through life. True, it is not heavenly happiness in its kind; nor is it unmixed. The fountain has been poisoned and the streams flow out contaminated. Still we all thirst for the waters, and earnestly seek that region where they flow most pure and abundant. The ambitious monarch believes he shall find them by desolating the earth; and that every cup of happiness he dashes from the lips of others, will be poured into his own. But he soon finds that he has filled his cup with wormwood and gall. The warrior's heart beats high in anticipation of the pleasure he shall feel, when the battle and the wreath of glory are won. But he finds that he has mistaken a sea of blood for a sea of happiness. The youthful Statesman, as he rises from one station to another in the councils of his country, but faintly realizes how far away from the regions of happiness, the surges and the storms of public life are driving him. The man who strives for pre-eminence in the learned professions, knows not, till the desired elevation has been reached, how high it stands above, not merely the follies, but the enjoyments of life. And so in many other pursnits; when the charm of novelty has passed away, when time has cooled the passions, and possession has disrobed the object of its false splendor, then it is found that the streams of happiness, like the streams of the desert, are almost dried up; leaving only their empty channels to mock desire. It is then that men begin to sigh for pursuits more calm, and peaceful, and retired. Hence it is, that so many, from the highest stations in life, have spent the evening of their days in the pursuits of aggriculture; in the prosecution of experiments for increasing the produce of the soil. Here they found that contentment and satisfaction, which in vain they had sought, in the possession of power, and wealth, and reputation, and learning. For when all

artificial pleasures have become insipid and even disgusting, rural scenes and pursuits have still the power to make new chords of happiness vibrate in the soul. We need not wonder then, that so many, after faithfully serving their God and generation, till exhausted nature demanded repose, have sought these scenes as a resting place from their toils; have landed on this peaceful shore, from the tempestuous voyage of public life. Says Washington, "I was summoned by my country, whose voice I can never hear but with veneration and love, from a retreat, which I had chosen with the fondest predilection, and, in my flattering hopes, as the asylum of my declining years."

It is not therefore, a mere poetic dream, that invests agricultural scenes and pursuits with a peculiar charm. Imagination may here resign her pencil into the hands of experience, nor fear that the picture will want in vividness and interest. Indeed, it was a deep acquaintance both with rural and with courtly scenes, that constituted the inspiration of the poet, when he sketched an eulogium upon agriculture, which the lapse of two thousand years has divested of none of its beauty and truth.

"Ah! happy swain! Ah! race beloved of heaven!
"If known thy bliss, how great the blessings given!
"For thee, just earth, from her prolific beds,
"Far from wild war, spontaneous nurture sheds.
"Though nor high domes, through all their portals wide,
"Each morn disgorge the flatterers refluent tide;
"Though nor thy gaze on gem wrought columns rest,
"The brazen bust and gold embroider'd vest;
"Nor poi oning Tyre thy snowy fleeces soil,
"Nor cassia taint thy uncorrupted oil;
"Yet peace is thine, and life that knows no change,
"And various wealth through nature's boundless range,
"The grot, the living fount. the umbrageous glade,
"And sleep on banks of moss beneath the shade;
"Thine all of tame and wild, in lawn and field,
"That pastured plains or savage woodlands yields:
"Content and patience youth's long toil assuage;
"Repose and reverence tend declining age:
"There gods yet dwell, and as she fled mankind,
"There Justice left her last lone trace behind."